Demo: An X3D Extension for Declarative 3D Style Sheets

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ABSTRACT

This paper presents a demonstration of an interactive 3D video on demand catalogue based on an innovative extension proposal to the X3D standard for 3D style sheets representation (X3DSS). This extension provides Web3D designers with a declarative way to build groundbreaking 3D graphical user interfaces (3DGUI) for Web3D. Thanks to new nodes allowing accessing a well-structured set of contents, the solution we propose offers many benefits. Indeed, this X3D extension takes advantage of both 3D declarative formats and style sheets. Firstly, the presented solution provides web3D designers with all essential features of X3D for building innovative 3DGUIs. Secondly, the extension brings the key features of a style sheet that enable the separation of the presentation and interaction semantics from the document content, well-suited for dynamic contents and presentation reusability. X3D based 3D style sheet offers a high level declarative representation pooling both requirements of the Web and 3D graphics community.

Categories and Subject Descriptors

I.3.6 [**Methodology and Techniques**]: Standards—*Languages*; I.3.7 [**Computer Graphics**]: Three-Dimensional Graphics and Realism—*Virtual Reality*

Keywords

Web-based interactions, Graphical User Interfaces, Multimedia databases, Languages and structures

1. INTRODUCTION

A wide range of use cases could benefit of 3DGUIs on the Web, essentially when Web services consist in presenting a huge amount of multimedia contents (video, music or photo catalogues, art pieces, consumer items for v-shopping, navigation within open data, etc). Well-designed 3D graphical and interaction user interfaces can ease the navigation within a huge amount of multimedia contents while improving the user experience. Firstly, the CSS3 based 3DGUIs such as carousels, image cubes or walls, already become a usual way to present a set of images or videos within web pages. But more promising 3D presentations can revolutionize the next generation of the Web by providing users with a greater experience of navigation and interaction.
However, the usability of 3DGUIs, in terms of navigation and interaction, is mainly related to the presentation metaphor. The design of such new 3DGUIs requires efficient tools to give designers with free rein to their creativity. The standard file formats VRML and X3D, that have inspired most of 3D formats, offers graphic designers a declarative way fully suitable for hardware graphic acceleration to define 3D virtual applications. Moreover, related works proposed solutions to automatically build 3D scenes presenting external data sets such as a virtual museum with X-VRML [4], or curricula for chemistry [2] and education [3] based on XSLT. More recently, Esnault et al. has presented a 3D style sheet language offering more reusability well-suited Web requirements [1]. The following demonstration is based on an X3D extension specification of this last related work.

2. 3D STYLE SHEETS

2.1 Overview

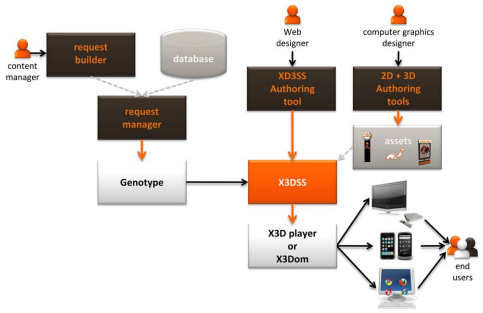

Figure 1: 3D style sheet pipeline

The X3D extension for 3D style sheet aims to provide an efficient solution to define attractive and customized presentation metaphors for huge database visualization. Figure 1 shows the full pipeline strongly inspired by Web authoring tools. A content manager extracts the required information from an input database (a video on demand catalogue) and

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organizes them within a genotype thanks to a request manager. For his part, a web designer defines the presentation metaphor thanks to an X3D based style sheet detailed next. This style sheet can include 2D or 3D assets designed by a computer graphic designer using any 3D computer graphic softwares. The X3D based style sheet can be directly loaded by a dedicated player, which will apply it on the fly to input datas stored in a genotype and render the resulting 3DGUI in a standalone application, in a web browser or on a smartphone.
We present next the two main elements of our pipeline: the genotype and the X3D based style sheet.

2.2 Genotype

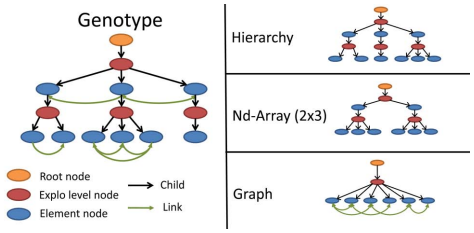

Figure 2: Genotype structure

The genotype is an XML file that stores the required data extracted from any kind of databases. The structure of the genotype is generic to be easily cross by the X3D based style sheet for accessing information. The structure of the genotype defines the way the user will explore the data through the resulting 3DGUI. Inspired from websites structures, the genotype is mainly organized as a hierarchy or more generally a graph structure. Every nodes of the graph store attributes values for an element (a content node) or an exploration level (a depth description in the hierarchy).

2.3 X3D based Style Sheet

The X3D extension for 3D style sheet aims to define the 3D space organization of data stored in the genotype. Indeed, we propose new X3D-based node categories to specify a 3D style-sheet:

- **Rules Node:** A set of 3D reconstruction rules that are applied to each exploration level of the genotype (based on prototype mechanism),
- **Genotype Exploration Nodes:** Control flow operators such as loops or conditions to cross the genotype,
- **Inquiries Nodes:** Inquiries to get access to the information stored in each node of the genotype (based on IS mechanism).

3. IMPLEMENTATION AND RESULTS

As shown in figure 3, two implementations are proposed to offer the best portability on main rendering outputs. The first one, suiting Web requirements, is described in [1]. The second one is a plug-in for Unity engine offering good portability for applications based services. Finally, in order to offer web designers a functional authoring tool to speed up the design of 3DGUIs, an editor plug-in is being implemented for the graphical editor of Unity.

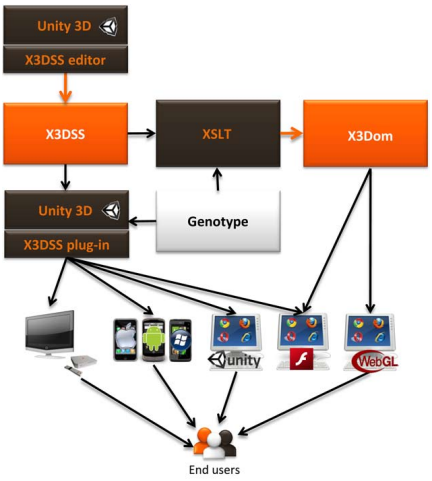

Figure 3: Platform architecture for Style Sheet visualization with various outputs.

A demonstration of a virtual environment for accessing a video on demand catalogue has been developed thanks to the proposed solution (see figure 4). The first exploration level corresponds to the genre of the movies and uses a theatre carousel rule as a presentation metaphor. The second exploration level corresponds to the release years and uses a linear distribution of doors, and finally the last exploration level corresponds to the movies themselves and uses a linear distribution of panels.

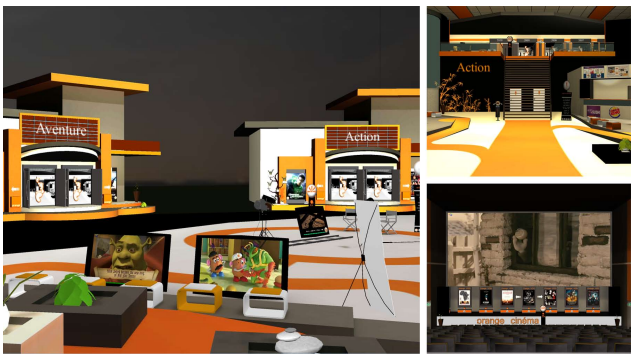

Figure 4: 3DGUI for a video on demand catalogue based on the X3D extension for style sheet.

4. REFERENCES

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